pleted (so far as anything in a museum can be said to be complete), while the Edentata, which was one of the first groups taken in hand, had been arranged at least a couple of years previously.

Limitations of space forbid fuller notice, and we may conclude by mentioning that while special chapters are devoted to his favourite subjects, anthropology and cetaceans, the three final chapters deal with the later and closing scenes of Sir William's life. Of four excellent portraits, those taken in his later years serve to remind old friends of Flower's striking personality. Bearing in mind the limitations already mentioned, the author is decidedly to be congratulated on the attractive manner in which he has laid before the public the main features of a very interesting and highly successful scientific career. R. L.

THE IDENTIFICATION OF ORGANIC COMPOUNDS.

A Method for the Identification of Pure Organic Compounds. Vol. i. By S. P. Mulliken, Ph.D. Pp. xii+364. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1904.) Price 21*s.* net.

THIS is the first of a series of volumes which are intended to facilitate the identification of organic substances. The scheme commonly, though not invariably, adopted by organic chemists in this connection is to determine the molecular formula of the compound under investigation, and then to refer to Richter's "Lexicon," in which all known organic compounds are tabulated according to their molecular formulæ. Further agreement is established by a comparison of physical and chemical properties. The author considers that the difficult technique of conducting an ultimate organic analysis, upon which the above system mainly depends, "is fully mastered only by long practice," and that there is a shorter cut to the same result. This short cut consists in finding, in the first instance, to what class of compounds—hydrocarbon, alcohol, aldehyde, acid, &c.—the substance belongs, and, when this has been done, in determining such simple physical characters as melting-point, boiling-point, specific gravity, colour, smell, &c., which will lead to its identification. It is therefore necessary for purposes of reference that all the known organic compounds should be grouped into separate classes. This is what the author has done. In each class the individual members are arranged in the order of increasing boiling-point or melting-point. For example, let us suppose that the substance, the identity of which is required, proves to be an acid. All the known organic acids are divided into tables of liquid and solid acids, and these again into categories, which are either soluble or insoluble in water. Suppose that the acid under investigation is a liquid which is soluble in water. Having turned to the table containing the liquid acids soluble in water, an examination of the first column of boiling points will lead, perhaps, to the discovery of one corresponding to the unknown acid. Under this compound a series of characteristic reactions are described which will enable the investigator to fix the identity of his compound by means of a few simple tests.

There is very little that is new in the above method. It is one which is adopted, consciously or otherwise, by the majority of chemists, whether they possess the skill requisite to conduct an ultimate organic analysis or not. That carefully elaborated methods are at present in use for determining the constitution of a substance by chemical tests is clearly shown by the existence of such a volume as Hans Meyer's, which has been translated into English, and has already reached a second edition.

In point of fact, when a substance has been obtained in a state of purity, its identification is as a rule not a serious undertaking. The character of the substance from which it is derived will usually furnish a clue to its nature, and a few characteristic tests will soon set the matter at rest. If the identification of a compound is a crucial matter, few chemists would rest content with anything less than a direct comparison of the product with the known substance, for melting- and boiling-points are apt to vary a little with the apparatus and form of thermometer employed, and colour reactions do not always produce quite the same tint unless the conditions of the experiment are the same.

It is the separation of a compound from a mixture and its purification which make the greatest demands on the skill and experience of a chemist. Compared with this, an ultimate organic analysis and the characterisation of a compound by chemical tests offer little difficulty.

There is no intention to disparage the labour which has been expended on this work. The careful revision of the reactions of many of the substances found in the tables would entitle the book to grateful recognition, in addition to which there is much useful and practical information on the method of applying the different reactions which every organic chemist will appreciate. It would be incorrect, moreover, to state that the tables will not serve the object for which they have been compiled. The question is only whether the object is worth the labour which it entails, seeing that most of the information may be derived indirectly from other sources.

The biological system of classification of substances into orders, genera and species cannot be commended. It is unnecessary and undesirable. There is no analogy in the application of these terms in the two sciences, and their use may be misleading. Chemical nomenclature still suffers in this country from such a false analogy, when *radicle* was adopted in place of *radical*. J. B. C.

THE MIND OF THE CHILD.

Educational Psychology. By Edward Thorndike, Adjunct Professor of Genetic Psychology in Teachers' College, Columbia University. Pp. vii + 177. (New York: Lemcke and Büchner, 1903.)

THIS volume embodies the results of investigations in which Prof. Thorndike has interested himself and his pupils for some time past, applying the methods

of experimental psychology to educational problems. Seeing that it is the first serious treatise on the subject which has yet appeared, such a pioneer work naturally deserves warm welcome and temperate criticism, even though there be important points of detail, both in the methods employed and in the conclusions drawn, which can hardly be accepted without reservation. As Prof. Thorndike ably points out in the last five pages of his book, there are numerous problems and experiments described by him which any trained teacher "can attack with a fair promise of success." His obvious aim in publishing this work at the present primitive stage of genetic psychology is to encourage a greater number of workers in the field of research with which he has so closely identified himself in the United States. For this reason, doubtless, he has omitted all consideration of the comparative data already available in other countries than his own.

The first two chapters are devoted to the methods of measurement and to the statistical distribution of mental traits within the community. The view is upheld that "the distribution of any mental trait in a homogeneous species undisturbed by selection is that given by the probability integral." It is to be regretted that the author has not devoted more space to statistical methods. Such sentences as the following, on p. 20, are surely unwise:—"The mathematical formulæ by which this is done need not concern us here." "Here again the mathematical formulæ are best omitted. The reader may take it on trust that such a transposition as the following is correct."

The third chapter concerns the correlation between different mental abilities in the same individual. An endeavour is made to define the certainty with which any scholar who is especially proficient in one subject of study will surpass or fail to reach the average in other subjects. It is experimentally shown that the phrase "ability in arithmetic" is "but an abstract name for a number of partially independent abilities."

The remaining chapters are concerned with experimental work upon the connection of mental traits with sex and age, upon the relation between mental and physical traits, and upon the influence of heredity and environment. Within the limits of this notice it is impossible even to summarise the many highly interesting results of the experiments of the author and his countrymen. As the author observes,

"The science of education when it developes will like other sciences rest upon direct observations of and experiments on the influence of educational institutions and methods made and reported with quantitative precision. . . . It is the vice or the misfortune of thinkers about education to have chosen the methods of philosophy or of popular thought instead of those of science. We ruminate over the ideas of Pestalozzi or Herbart or Froebel as if writing a book a hundred years ago proved a man inspired. . . . We are like chemists who should quarrel over the views of Paracelsus or Arnauld of Villeneuve. . . . In education everything is said but nothing proved" (p. 164).

This book is a worthy and welcome attempt to apply exact method to educational problems, although it leaves some little to be desired in style and general appearance.

CHARLES S. MYERS.

OUR BOOK SHELF.

Précis d'Électricité Médicale, Technique Électrophysiologie, Électrodiagnostic Électrothérapie, Radiologie, Photothérapie. By Prof. E. Castex. Pp. vii + 672; 208 figures. (Paris: F. R. de Rudeval, 1903.)

THE object of the author has been to furnish the medical student with a work which will be useful to him in the present state of electrical knowledge, but the author hopes that it will also not be without value to medical men who are devoting themselves to the special study of electrotherapeutics, and likewise to practitioners who have not had such opportunities.

The work is divided into five different sections, including technique, electrophysiology, electrodiagnosis, electrotherapy, and lastly the study of X- and other rays.

The author has been very successful in the arrangement of his matter, and the physical aspect of the question has not been neglected, judging, of course, from the medical point of view. The various currents employed in medicine, continuous, interrupted, sinusoidal, high-frequency, and static, have all been practically and efficiently explained. The second and third chapters, dealing with electrophysiology and diagnosis, will be found particularly useful to those who desire a practical and not too exhaustive guide. The application of electricity to the diseases of the different organs is described in concise and practical terms, a fact which will be useful to physicians who have not had the advantages of modern training at one of the electric departments which now form a part of most large hospitals. The last chapter, which is devoted to X-rays, occupies something like 120 pages, and cannot, of course, be expected to compete with the larger treatises, such as Bouchard's, recently published. But again Prof. Castex has shown his practical tendency by giving under each heading a short and very useful guide to the interpretation of photographic as well as radioscopic diagnosis, and radiotherapy itself, although briefly treated, has not been forgotten.

The work contains about 208 illustrations, well chosen to assist the student in understanding the theories, instruments, and clinical charts.

A careful perusal of the work will show that it has been written by one who understands his subject and the needs of the student and practitioner. It is concise, thoroughly practical, and just such a guide as should appeal to those for whom the author has written the work.

J. M.

Radium and All About It. By S. Bottone. Pp. 96; with four figures and four full-page plates. (London: Whittaker and Co., 1904.) Price 1s. net.

THE appearance of a popular shilling volume dealing with the properties of the salts of radium and the theory of radio-activity may be regarded as an indication of the wide interest that has been aroused by the discovery and investigation of the radio-active elements. There is much to be said in favour of the production of a book that shall satisfy the curiosity of those whose interest has been aroused but whose knowledge of chemistry and physics is insufficient to enable them to follow the developments of the subject in the technical journals. In spite of its rainbow-tinted cover and its somewhat boastful title, the present volume gives a substantially accurate account of the most important phenomena. It contains liberal quotations from the chief workers in the subject, though these are taken chiefly from articles that have appeared in the non-technical journals and reviews. The author appears to have derived his information almost entirely